

Stroke Activation

A stroke alert starts the clock: find out when the person was last acting normal, score their stroke severity with the NIH Stroke Scale, get a CT scan right away to rule out bleeding, give clot-busting medicine (tPA or TNK) within 4.5 hours if it's safe, and pull out large clots with a wire retriever (thrombectomy) within 24 hours if a big vessel is blocked.

THE ONE-LINE TRUTH

When brain tissue is starving for blood, every minute counts — fast action can save brain cells and reverse damage.

The chain — how it unfolds

1. A clot blocks a brain artery (or a vessel bursts), cutting off blood flow to downstream tissue. — why: Brain cells need oxygen delivered by blood every second to make energy (ATP) and stay alive — when the blood stops, the cells run out of fuel in about 3–5 minutes and start to die.
2. The blood-starved (ischemic) core (center of the blocked zone) dies fast, but the penumbra (border zone getting a trickle of blood from side streets) stays stunned and salvageable for a few hours. — why: Cells in the penumbra are hurt and not working, but they haven't died yet — if you restore blood flow quickly (with tPA or thrombectomy), those cells wake back up and function returns.
3. Sudden one-sided weakness, face droop, slurred speech, vision loss, dizziness, or trouble walking appear within seconds to minutes. — why: Each part of the brain controls specific jobs (the motor strip moves your muscles, Broca's area makes speech, the visual cortex processes sight, the cerebellum runs balance), so whichever artery is blocked determines which function fails — it's a map, not random.
4. The blood-brain barrier starts breaking down after a few hours, and swelling (cerebral swelling (edema)) builds up in the dead tissue, raising pressure inside the skull. — why: Dead cells leak fluid and inflammatory chemicals, the tissue swells like a bruise, and in large strokes (especially cerebellar or malignant MCA strokes), the brain can run out of room in the skull and herniate, crushing the brainstem and causing coma or death.

5. If tPA is given too late, or if the clot breaks apart on its own after the blood-brain barrier is leaky, blood spills into the stroke zone (hemorrhagic transformation), turning an blood-starved (ischemic) stroke into a bleed. — why: The broken barrier can't hold back blood anymore, so restoring flow after the tissue is already dead just floods the area — this is why the tPA window is strict (4.5 hours) and why we do a CT scan first to make sure there's no bleeding already.
6. In bleeding-driven (hemorrhagic) stroke, blood pools in or around the brain, acting like a growing mass that squeezes brain tissue, raises intracranial pressure, and can cause herniation or rebleeding. — why: Blood outside a vessel is toxic to brain cells (it releases iron and inflammatory signals), and the physical pressure crushes tissue and blood vessels, cutting off flow to areas that weren't even hit by the original bleed.
7. Without fast treatment, dead brain tissue is permanent — the neurons don't grow back, so the person is left with lasting weakness, speech trouble, vision loss, or paralysis matching the artery that was blocked. — why: Brain cells are specialized and can't regenerate like skin or liver — once they die, that function is lost forever, unless nearby healthy tissue can slowly learn to take over some of the job through rehab and neuroplasticity.
8. Restoring blood flow early (with tPA, TNK, or thrombectomy) saves the penumbra, reverses symptoms, and dramatically improves outcomes — 'time is brain,' so every minute of delay costs about 1.9 million brain cells. — why: If you break up or pull out the clot while the penumbra is still alive, oxygen and glucose flood back in, the stunned cells recover, and the person can walk out of the hospital with little or no disability — but the window is short, so stroke is always a medical emergency.

Spot it — what you see, and why

- Sudden weakness or numbness on one side of the face, arm, or leg: A clot or bleed in the brain blocks blood flow to the strip of brain tissue that controls movement and feeling on the opposite side of the body. Without oxygen, those brain cells stop working within minutes, so the muscles they control go weak or numb right away.
- Sudden trouble speaking or understanding words (slurred speech or confused answers): The left side of the brain (in most people) holds the language centers—Broca's area (speech production) and Wernicke's area (understanding words). When a stroke cuts off their blood supply, the person cannot shape words clearly or make sense of what others are saying.
- Sudden vision loss in one or both eyes, or double vision: The back of the brain (occipital cortex) processes what the eyes see, and the brainstem controls eye movements. A stroke there scrambles the signals, so vision goes dark in part of the field, or the eyes cannot line up and the person sees two of everything.

- Sudden severe headache (often called the worst headache of my life): When a blood vessel in the brain tears open (hemorrhagic stroke), blood spills into the space around the brain and irritates the meninges (the protective covering), which have many pain nerves. The sudden pressure spike inside the skull triggers intense pain.
- Sudden trouble walking, loss of balance, or dizziness: The cerebellum (the brain's balance center at the back) and parts of the brainstem coordinate posture and smooth movement. When stroke damages these areas, the person cannot steady themselves, feels the room spinning, or veers to one side when trying to walk.
- Sudden confusion or trouble understanding what is happening around them: Large strokes—especially in the frontal or temporal lobes—disrupt the networks that keep a person alert and aware. Without enough oxygen, these brain cells misfire, so thoughts become jumbled and the person cannot follow conversations or know where they are.

Red flags — act now

- Symptoms started suddenly—within seconds or minutes—rather than building slowly over hours or days.
- The person cannot lift both arms to the same height, one side of the face droops when they smile, or their speech is slurred or makes no sense (positive FAST screen).
- Worst headache of my life, especially with stiff neck, vomiting, or sudden collapse—suggests bleeding in the brain (hemorrhagic stroke) rather than a clot.
- Symptoms are still present when emergency help arrives—do NOT wait to see if they go away, because every minute of lost blood flow kills about two million brain cells.
- History of atrial fibrillation (an irregular, quivering heartbeat) (irregular heartbeat), recent heart attack, or use of blood thinners—raises the chance of a stroke caused by a clot traveling from the heart or a dangerous bleed.

Treat it — in this order

1. Activate the stroke team and document exact time last known well → Knowing the precise minute the person was last acting normal unlocks the treatment window. IV thrombolytics (tPA or tenecteplase) work best within 3 hours and can be given up to 4.5 hours. Mechanical thrombectomy works up to 6 hours for most strokes and up to 24 hours if imaging shows salvageable brain tissue. Without this time, we cannot safely give either treatment.

2. Non-contrast CT of the head immediately (door-to-CT goal under 20 minutes) → This scan separates bleeding-driven (hemorrhagic) stroke (bleeding) from blood-starved (ischemic) stroke (clot). If we see blood, clot-busting medicine is absolutely forbidden because it will turn a small bleed into a deadly one. If we see no blood, we can move forward with tPA or thrombectomy. This one image decides the entire treatment path.
3. Check and correct blood glucose if below 60 mg/dL → Giving IV dextrose or oral glucose raises blood sugar within minutes and reverses stroke-like symptoms if low blood sugar (hypoglycemia) was the real problem. This avoids giving dangerous clot medicine to someone who never had a stroke. If symptoms persist after glucose correction, we know the problem is a true clot.
4. Give IV alteplase (tPA) 0.9 mg/kg (max 90 mg) or IV tenecteplase (TNK) 0.25 mg/kg within 4.5 hours of symptom onset → Thrombolytics break apart the fibrin mesh holding the clot together, dissolving it and restoring blood flow to the downstream brain tissue. The sooner the clot dissolves, the more brain cells survive. For every 15-minute delay, the chance of good recovery drops measurably. This medicine improves odds of independent living by about 30% if given early.
5. Mechanical thrombectomy (catheter-based clot retrieval) within 6 hours for large-vessel blockage (occlusion), up to 24 hours if imaging shows salvageable tissue → A neurointerventionalist threads a catheter up through the groin artery into the blocked brain artery, then pulls the clot out with a stent retriever or suction device. This restores blood flow in minutes and works even for clots too large for medicine to dissolve. Thrombectomy improves the chance of walking and living independently by about 50% in large-vessel strokes.

Your top priorities at the bedside

1. Activate the stroke team immediately and document the exact time the patient was last known well (last seen normal). — why: Brain cells die at a rate of 1.9 million per minute during stroke. The last known well time determines if the patient qualifies for tPA (within 4.5 hours) or thrombectomy (within 6 to 24 hours). Time is brain.
2. Keep the patient NPO (nothing by mouth) until a swallow screen is completed—no food, liquid, or pills by mouth. — why: Stroke can damage the swallowing muscles and nerves, causing trouble swallowing (dysphagia) (difficulty swallowing). Giving food or liquid before a swallow test can cause aspiration (food or liquid entering the lungs), leading to pneumonia or choking.

3. Check blood glucose immediately with a fingerstick and give IV dextrose if glucose is below 60 mg/dL. — why: Low blood sugar (Hypoglycemia) (low blood sugar) mimics stroke symptoms like confusion, weakness, and slurred speech. Correcting low glucose can reverse symptoms immediately and prevents unnecessary tPA administration. Low glucose also worsens brain injury during stroke.